CLAIMS:

1. A plasma generator having a plasma channel therein extending along a central axis and comprising:

a plurality of cathodes positioned at a first end of the plasma channel and arranged radially about the axis;

an anode element positioned at a second end of the plasma channel, the anode element having a central bore therein and a plurality of arc attachment regions along a surface of the central bore, each attachment region corresponding to a respective cathode and configured to provide a substantially radially predefined attachment point for an electrical arc extending between the attachment region and the respective cathode.

2. The plasma generator of claim 1, further comprising at least one gas inlet near the first end of the plasma channel through which gas can be injected into the channel.

3. The plasma generator of claim 1, wherein each arc attachment region comprises an elevation of the surface of the central bore towards the central axis.

4. The plasma generator of claim 3, wherein each elevation comprises a ridge having an upper surface relative to the central axis and at an angle thereto.

5. The plasma generator of claim 3, wherein a contour of the central bore along a cross-section perpendicular to the central axis corresponds to an outer edge of a plurality of overlapping generally circular bodies arranged around the central axis.

6. The plasma generator of claim 5, wherein the circular bodies are arranged symmetrically around the central axis and have substantially equal diameters.

7. The plasma generator of claim 3, wherein the surface of the central bore comprises tungsten.

8. The plasma generator of claim 7, wherein the central bore is defined by a tungsten sleeve contained within the anode element.

9. The plasma generator of claim 1, wherein the anode element is substantially comprised of a first electrically conductive material having a first thermal conductivity and the arc attachment regions comprise a second electrically conductive material having a second thermal conductivity less than the first thermal conductivity.

10. The plasma generator of claim 9, wherein the first electrically conductive material comprises copper and the second electrically conductive material comprises tungsten.

11. The plasma generator of claim 9, wherein the arc attachment regions comprise axially elongated members mounted in the anode element.

12. The plasma generator of claim 11, wherein at least a portion of each member is exposed along the surface of the central bore, the exposed portions forming the arc attachment regions.

13. The plasma generator of claim 12, wherein the exposed portions are proud relative to adjacent areas of the surface of the central bore.

14. The plasma generator of claim 13, wherein the anode element is substantially comprised of copper and the members substantially comprise tungsten pins inserted into corresponding openings in the anode element.

15. The plasma generator of claim 1, wherein the anode element has a plurality of cooling channels therein, the cooling channels configured to allow a coolant to remove heat from the arc attachment regions at a first rate and to remove heat from regions adjacent the arc attachment regions at a rate greater than the first rate;

wherein the arc attachment regions will be cooled more slowly than the adjacent regions.

16. The plasma generator of claim 1, further comprising a plurality of powder injection ports arranged in a substantially fixed configuration with relation to the arc attachment regions.

17. The plasma generator of claim 16, wherein the anode element and at least part of the powder injection ports comprise an integral member.

18. An anode element for use in a plasma generator having a plurality of cathodes comprising;

an electrically conductive body having a central bore therein and a plurality of arc attachment regions arranged along a surface of the central bore, each attachment region providing a substantially radially predefined attachment point for an electrical arc extending between the attachment region and a respective cathode when the anode nozzle element is used in the plasma generator and sufficient current is applied across the anode element and the plurality of cathodes.

19. The anode element of claim 18, wherein each arc attachment region comprises an elevation of the surface of the central bore towards the central axis.

20. The anode element of claim 19, wherein each elevation comprises a ridge having an upper surface relative to the central axis and at an angle thereto.

21. The anode element of claim 19, wherein a contour of the central bore along a cross-section perpendicular to the central axis corresponds to an outer edge of a plurality of overlapping generally circular shapes arranged around the central axis.

22. The anode element of claim 21, wherein the circular shapes are arranged symmetrically around the central axis and have substantially equal diameters.

23. The anode element of claim 19, wherein the surface of the central bore comprises tungsten.

24. The anode element of claim 23, wherein the central bore is defined by a tungsten sleeve contained within the body.

25. The anode element of claim 18, wherein the body comprises a first electrically conductive material having a first thermal conductivity and wherein the arc attachment regions comprise a second electrically conductive material having a second thermal conductivity less than the first thermal conductivity.

26. The anode element of claim 25, wherein the first electrically conductive material comprises copper and the second electrically conductive material comprises tungsten.

27. The anode element of claim 25, wherein the arc attachment regions comprise axially elongated members mounted at least partially within the body.

28. The anode element of claim 27, wherein at least a portion of each member is exposed along the surface of the central bore, the exposed portions forming the arc attachment regions.

29. The anode element of claim 28, wherein the exposed portions are proud relative to adjacent areas of the surface of the central bore.

30. The anode element of claim 29, wherein the body is substantially comprised of copper and the members substantially comprise tungsten pins inserted into corresponding openings in the body.

31. The anode element of claim 18, further comprising a plurality of cooling channels therein, the cooling channels configured to allow a coolant to remove heat from the arc attachment regions at a first rate and to remove heat from regions adjacent the arc attachment regions at a rate greater than the first rate;

wherein the arc attachment regions will be cooled more slowly than the adjacent regions.

32. The anode element of claim 18, further comprising a plurality of powder injection ports arranged in a substantially fixed configuration with relation to the arc attachment regions.

33. The anode element of claim 32, wherein the anode element comprises an integral member.